

## **Health Consultation**

Great Kills Park  
Richmond County  
Gateway National Recreation Area  
National Park Service  
Staten Island, New York



### **Prepared by**

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## **Summary and Statement of Issues**

The US Environmental Protection Agency (EPA), Region II office contacted the Agency for Toxic Substances and Disease Registry (ATSDR) Region II office requesting assistance in addressing radiological data collected in the Great Kills Park, Staten Island, New York. The EPA request to ATSDR was to develop a public health statement based on the existing limited data so that park users would be aware of their potential public health consequences. Great Kills Park is in the Staten Island unit of the Gateway National Recreation Area operated by the National Park Service. In 2005, a flyover radiation survey for New York City identified an elevated radiation reading within the park. Additional area surveys located additional elevated readings.

## **Background**

### **Site Description and History**

Great Kills Park in Richmond County, Staten Island, New York, is bounded on the northwest by Hylan Boulevard. The towns of Great Kills, Great Kills Harbor, and Crookes Point are on the west side of the park. Raritan Bay is on the southeast, where the boundary continues along the bay to Oakwood Beach. The northeast boundary of the park is slightly northeast of Emmet Avenue, the entrance to the park (1). The park apparently was the result of a planned operation to reclaim the area from the surrounding marshy areas and waters. Historical documentation indicates that fill operations began in the 1940 ultimately resulting in the deposition of approximately 15 million cubic yards of fill materials. From 1955 to 1959, clay and sludge were added to form the topsoil for the park (1). Later, the US Government purchased the land and formed the national recreation area which is now part of the National Park Service. The area contains baseball fields, soccer facilities, a model airplane recreational area consisting of a runway and associated activities.

During a 2005 radiation flyover by the New York Police Department, a radiation hotspot was found near the model airplane field. A flyover is typically performed to determine background levels of radiation over a large area or to assist in the location of radioactive sources. Following a brush fire in the park in 2007, a National Park Service Ranger equipped with an alarming radiation monitor located another hotspot in the fire area. As a result, the New York City Department of Health and Mental Hygiene (DOHMH) performed additional radiation surveys and located additional areas of elevated radioactivity. The survey site is shown in Figure 1 and the reported results are shown in Table 1.

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1 Wrenn TP (1975). General History, Gateway National Recreation Area, New York, NY Jamaica Bay, Breezy Point, and Staten Island Units. Prepared for the National Park Service (Order Number: PX 1600-5-0353).



**Figure 1. Great Kills Park and survey areas**

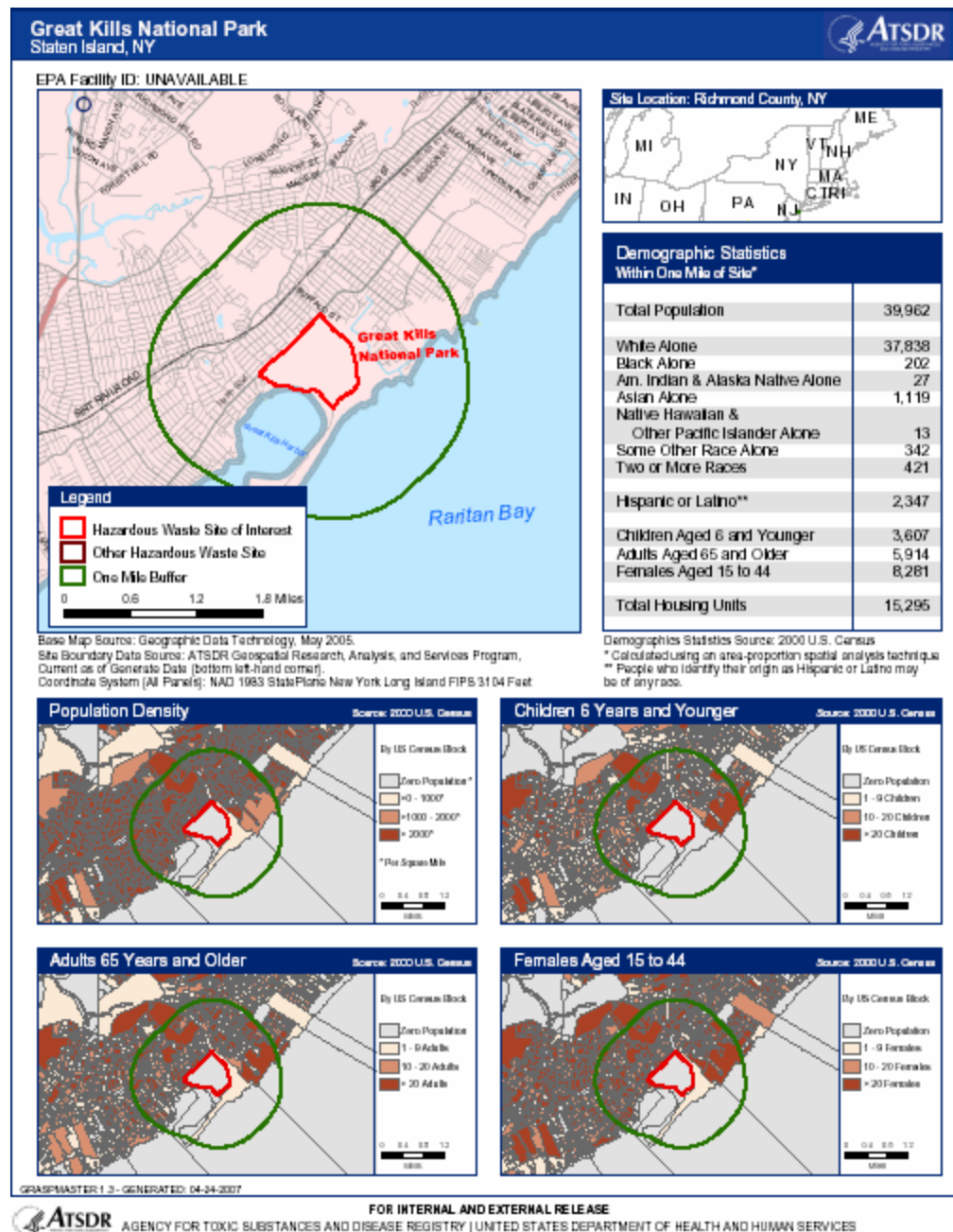
The park is open during daylight hours daily. The official sport season is from the third week in April through November for baseball, softball, and soccer. These activities are at the athletic field complex. The sport activities are usually over by August for baseball and softball; soccer typically ends in November.

### **Demographics**

Staten Island, one of the boroughs comprising New York City, is the third-largest borough of New York City (with an area of 60 square miles). It is the least populated of the five boroughs<sup>2</sup>. The US Census estimates the population at 464,573 with 51.4% of the population comprised of females<sup>3</sup>. The number of housing units is estimated at 173,954. ATSDR estimates the demographic composition of a population within one mile of an area. In the case of Great Kills, the estimated total population is 39,900 individuals with 3600 children under the age of 6. The number of women of childbearing age (15 to 44 years of age) is estimated at 8,281. Additional details are given in Figure 2.

<sup>2</sup> New York Public Library (<http://www.nypl.org/branch/staten/>) accessed on April 25, 2007.

<sup>3</sup> US Census Bureau web site (<http://quickfacts.census.gov/qfd/states/36/36085.html>) accessed on April 25, 2007.



**Figure 2. Demographic analysis for Great Kills Park**

## Community Health Concerns

The public health concern associated with this site is the impact of external radiation exposure in the park during recreational activities.

## Discussion

The information supplied to ATSDR is narrow in scope. The readings, shown in Table 1, indicate the locations of the areas of contamination; moreover, these data are external radiation readings only and no indications of the total area of contamination are given. Estimation of radiation dose can be made based on these data; however, one must be aware that the estimates are limited in nature and apply only to a maximum distance of 3 feet from the discovered contamination. Therefore, these results should only be used for informational purposes and not to determine the adequacy of regulatory compliance.

For the evaluation of radiological dose that one might receive using the specific areas of Great Kills Park, ATSDR used the following parameters: 1) Park hours of operation – 10 hours per day; 2) length of soccer and baseball and softball season of 229 days and 138 days, respectively; and 3) the exposure rate varying over the range of the reported values. That is, any exposures were possible from the contact rate out to a distance of 3 feet. Table 1 gives the exposure data supplied to ATSDR.

Because of the uncertainty in these exposure parameters (time and distance), ATSDR performed an uncertainty analysis using commercially available software. Realizing that an individual would not necessarily use the park for 10 hours per day nor continuously occupy the 3 foot diameter area around the elevated readings, ATSDR selected a normal distribution with the average time in the contaminated area of 3 hours per day. For the possible maximum exposures, ATSDR also selected a triangular distribution with the most probable exposure rate being the geometric mean of the measurements. The reasoning is that for an individual to receive the contact exposure rate, they would have to remain on that exact location during their time in the park. The parameters used are supplied in Table 2.

The estimated average radiation exposures and the estimated upper boundary of the radiation exposures are given in Table 3. The assessment of radiation exposure on children requires special considerations as the activities of children, even those of different ages, vary significantly from that of adults. For example, the outdoor activities of children typically exceed those of adults or even adults who maintain active lifestyles. Children may engage in hand-to-mouth behaviors that increase their exposure potential to contaminated soils or water and their rates of respiration can differ from adults. Other factors that require children-specific evaluation include body mass, age, height, and weight. For some radiological contaminants special consideration must also be given for specific organs as many radioactive substances concentrate in one particular organ.

Table 3The average exposure is what ATSDR believes a maximum user of the park will receive and the upper bound estimates that 97.5% of all users would receive a radiation exposure less than the value given in the table.

**Table 1. Radiation exposure data for Great Kills Park\***

<i>Hotspot Location</i>	<i>Ground Contact</i>	<i>1 foot elevation</i>	<i>3 foot elevation</i>	<i>Area Background</i>
Ballfield 1	3.2	0.90	0.40	0.009 to 0.025
Brush Fire	0.42	0.14	0.07	
Sewer Line 1	10.5	3.0	1.04	
Sewer Line 2	2.37	0.73	0.32	

\* The exposure data are given in milliroentgens per hour (mR/h).

**Table 2. Activity use parameters for Great Kills Park**

<i>Location</i>	<i>Time in park</i>	<i>Days of Activity per year*</i>
Baseball Field 1	3 hours per day with 95% of the population there 7 hours per day	For soccer, 229 days For baseball, 138 days
Brush Fire Area		
Sewer Line Area 1		
Sewer Line Area 1		

\* The activity presumes the typical park user is in the park playing either soccer or baseball everyday.

## Child Health Considerations

The assessment of radiation exposure on children requires special considerations as the activities of children, even those of different ages, vary significantly from that of adults. For example, the outdoor activities of children typically exceed those of adults or even adults who maintain active lifestyles. Children may engage in hand-to-mouth behaviors that increase their exposure potential to contaminated soils or water and their rates of respiration can differ from adults. Other factors that require children-specific evaluation include body mass, age, height, and weight. For some radiological contaminants special consideration must also be given for specific organs as many radioactive substances concentrate in one particular organ.



**Table 3. Estimated Annual Radiation Exposures in Great Kills Park\***

<i>Park Location</i>	<i>Activity</i>	<i>Average annual estimated radiation exposure (mR)</i>	<i>Upper bound of radiation exposure (mR)</i>
Ball field 1	Soccer	1065	3000
	Baseball	640	
Brush fire area	Soccer	150	245
	Baseball	90	
Sewer Line area 1	Soccer	3360	6000
	Baseball	2035	
Sewer Line area 2	Soccer	875	2500
	Baseball	530	

\* The estimated radiation exposures are given in units of milliroentgens (mR)

Because several of the areas of the park are not in the typical use areas, ATSDR also estimated the radiation dose an individual might receive while walking through the contaminated areas. These times ranged from a maximum of approximately 1 minute and an average of 36 seconds. The calculated doses from this estimation are given in Table 4.

**Table 4. Estimated radiation doses from walking near the contaminated areas.**

<i>Park Location</i>	<i>Average annual estimated radiation exposure (mR) from walking near areas</i>	<i>Upper bound of radiation exposure (mR)</i>
Ball field 1	18	48
Brush fire area	2.5	6.5
Sewer Line area 1	56	157
Sewer Line area 2	15	37

## Conclusions

ATSDR has reviewed limited radiological exposure data for Great Kills Park, Staten Island, New York. Because the data for this site was very limited in scope, ATSDR determined that an uncertainty analysis would be necessary in an attempt to characterize the potential impact on those individuals using the park in recreational activities. These activities were limited to soccer and baseball in those specific areas of the park where the radiation readings were determined to be above regional background levels that ranged as high as 0.025 mR/h or about 150 mR per year. Also included in the evaluation was an individual walking near the contaminated areas. Including all sources of radiation, the annual background radiation in the United States is about twice this value. The total background would include radiation from soils, water, food, cosmic rays, nuclear fallout from atmospheric tests, Chernobyl, and other man-made radiation generating devices such as medical examinations<sup>4</sup>.

The ATSDR conclusions are based on the limited information supplied and analyses of this information. The request from the EPA was to evaluate exposures that have occurred in the past for these areas of concern. **Based on this information, ATSDR considers the known contaminated areas to be an Indeterminant Public Health Hazard.** Nonetheless, ATSDR believes the hazards to public health from past exposures are not expected to be a health hazard for the following reasons:

- 1) The currently available limited data indicate the contamination detected thusfar, is only in 4 distinct areas;
- 2) The radiation exposure measurements at these locations indicate significant attenuation at a distance of 3 feet;
- 3) The brush fire area and sewer line areas do not appear to be locations where significant amounts of activities occur;
- 4) The baseball field contamination appears to be limited to an area outside the typical base paths;
- 5) It is very unlikely that an individual would remain in the exact 3 foot radius of where the contamination was detected for 3 hours or more; and
- 6) The most likely scenario is one of an individual walking briefly through the contaminated areas.

## Recommendation

ATSDR believes there is currently insufficient data to fully characterize the extent of the potential contamination in Great Kills Park. As such, the following recommendations are put forth for consideration by the EPA, the US Park Service, and the City of New York:

1. Perform historical archive search to evaluate the types of radiological and/or chemical materials that may have been in the fill used during park construction in order to determine the type of sampling and analyses needed to characterize the park
2. Based on the historical analysis, perform a complete characterization of the park to include at a minimum surface radiological readings, soil borings; and

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<sup>4</sup> ATSDR (1999). Toxicological Profile for Ionizing Radiation. Atlanta: US Department of Human Services

3. Perform detailed characterizations of the current elevated radiation areas and any additional areas that might be located using appropriate analyses such as alpha spectroscopy, beta analyses, and gamma spectroscopy.

### **Public Health Action Plan**

1. The areas of currently detected contamination have been restricted from use by the National Park Service.
2. ATSDR will be available to the EPA and partners through interactions with the ATSDR Region II office as needed.
3. ATSDR will review additional data as it becomes available to determine if this documents needs to be revised.

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